AMENDMENTS TO THE SPECIFICATION:

Please amend the title as follows:

~~AN~~ APPARATUS FOR MANUFACTURING MOLTEN IRONS BY HOT COMPACTING FINE DIRECT REDUCED IRONS AND CALCINED ADDITIVES AND METHOD USING THE SAME

The paragraph beginning on page 1, line 6 has been changed as follows:

The ~~present~~ invention relates to an apparatus and method for manufacturing molten iron. More particularly, the ~~present~~ invention relates to an apparatus and method for manufacturing molten iron in which fine direct reduced iron and calcined additives are supplied to a melter-gasifier after these materials undergo hot compacting to thereby manufacture molten iron.

The paragraph beginning on page 2, line 14 has been changed as follows:

U.S. Patent ~~Publication~~ No. 5,534,046 discloses an apparatus for manufacturing molten iron that directly uses common coal and fine ores. FIG. 9 shows a simplified version of an apparatus for manufacturing molten iron disclosed in U.S. Patent ~~Publication~~ No. 5,534,046. As shown in FIG. 9, a conventional molten iron manufacturing apparatus 900 includes three fluidized-bed reactors 910 in which fluidized beds are formed, and a melter-gasifier 960 connected thereto. Fine ores and additives at room temperature are charged in the first fluidized-bed reactor, then sequentially passed through all three of the fluidized-bed reactors 910. Since high temperature reducing gas is supplied to the three fluidized-bed reactors 910 from the melter-gasifier 960, the fine ores and additives increase in temperature as a result of the contact made with the high temperature reducing gas. At the same time, 90% or more of the fine ores and additives at room temperature is reduced, and 30% or more of the same is calcined then charged into the melter-gasifier 960.

The paragraph beginning on page 3, line 14 has been changed as follows:

To overcome this problem, there is being researched a method in which fine direct reduced iron and calcined additives are hot compacted and charged in a melter-gasifier. As an example, a method and apparatus for manufacturing elliptical sponge iron briquettes are disclosed in U.S. Patent ~~Publication~~ No. 5,666,638. Also, U.S. Patent Nos. 4,093,455, 4,076,520, and 4,033,559 disclose a method and apparatus for manufacturing plate-shaped and corrugated irregular sponge briquettes. Such sponge briquettes are realized by hot compacting fine direct reduced iron then cooling the same to obtain a density of 5 tons/m^3 such that the sponge briquettes are suitable for long distance transportation.

The paragraphs beginning on page 4, line 21 have been changed as follows:

The ~~present~~ invention has been made in an effort to solve the above problems. The present invention provides an apparatus and method for manufacturing molten iron in which fine direct reduced iron and calcined additives are used after undergoing hot compacting.

It is an object of the ~~present~~ invention to manufacture compacted material in such a manner that it is continuously formed without breaks or being split apart and the amount of powder produced is reduced.

To achieve ~~the above~~ <u>this</u> object, the ~~present~~ invention provides a method for manufacturing molten iron includes producing reducing material of mixed hot fine direct reduced iron and calcined additives, the reducing material being produced from multiple fluidized beds; charging the reducing material to at least one pair of roller presses; roll pressing the reducing material through the one pair of roller presses to produce continuous compacted material having protrusions formed on pressed surfaces; crushing the compacted material; charging the crushed compacted material to a coal packed bed; and supplying oxygen to the coal packed bed to manufacture molten iron, wherein in the producing compacted material, the compacted material is formed such that acute and obtuse angles are

formed between a center line formed along a length of a cross section that is cut along a lengthwise direction perpendicular to an axial direction of the roller presses and connecting lines that connect grooves closest to each other across the cross sectional area.

The paragraph beginning on page 9, line 3 has been changed as follows:

The accompanying drawings, which together with the specification, illustrate exemplary embodiments of the present invention, and, together with the description, serve to explain the principles of the ~~present~~ invention.

FIG. 1 is a schematic view of an apparatus for manufacturing molten iron according to an embodiment of the ~~present~~ invention.

FIG. 2 is a sectional view of a charge container according to an embodiment of the ~~present~~ invention.

FIG. 3 is a drawing schematically showing roller presses and compacted material formed by the same according to an embodiment of the ~~present~~ invention.

FIG. 4 is a sectional view of compacted material manufactured according to an embodiment of the ~~present~~ invention.

FIG. 5 is a drawing schematically showing an operation of roller presses and a first crusher according to an embodiment of the ~~present~~ invention.

FIG. 6 is a sectional view of a cooler according to an embodiment of the ~~present~~ invention.

FIG. 7 is a drawing schematically showing a dust collector according to an embodiment of the ~~present~~ invention.

The paragraph beginning on page 9, line 27 has been changed as follows:

Preferred embodiments of the ~~present~~ invention will now be described in detail with reference to the accompanying drawings. It should be clearly understood that many variations

and/or modifications of the basic inventive concepts may appear to those skilled in the present art. The embodiments are to be regarded as illustrative in nature, and not restrictive.

The paragraph beginning on page 10, line 6 has been changed as follows:

The molten iron manufacturing apparatus 10 includes a hot compacting assembly 100, a fluidized-bed reactor unit 300, and a melter-gasifier assembly 400. The fluidized-bed reactor unit 300 includes multiple stages of fluidized-bed reactors having fluidized beds. In FIG. 1, an example is shown in which the fluidized-bed reactor unit 300 has four fluidized-bed reactors. However, the ~~present~~ invention is not limited to this number of fluidized-bed reactors. The four fluidized-bed reactors include a first pre-heating furnace 310, a second pre-heating furnace 320, a preliminary reducing furnace 330, and a final reducing furnace 340. The four fluidized-bed reactors reduce and calcine fine ores and additives at room temperature using reducing gas supplied from a melter-gasifier 430 to manufacture a mixed reducing material, and supply the same to the hot compacting assembly 100. The hot compacting assembly 100 roll presses and crushes the reducing material to manufacture compacted material. The hot compacting assembly 100 then supplies the compacted material to the melter-gasifier assembly 400.

The hot compacting assembly 100 according to the embodiment of the ~~present~~ invention includes the basic elements of a charge container 20, a pair of roller presses 30, and a first crusher 40. The hot compacting assembly 100 also includes a hot storage container 11, a cooler 60, a storage tank 69, a branching unit 50, a hot separator 70, a second crusher 80, and a hot conveying unit 90. The hot compacting assembly 100 according to the embodiment of the present invention may also include other elements as needed.

The paragraph beginning on page 11, line 27 has been changed as follows:

FIG. 2 is a sectional view of the charge container 20 according to an embodiment of the ~~present~~ invention, and shows a cross section of the charge container 20 when cut along the direction reducing material is charged.

The paragraph beginning on page 12, line 23 has been changed as follows:

Referring back to FIG. 1, at least a pair of roller presses 30 are mounted to a lower end of the charged container 20. The roller presses 30 roll press the reducing material into continuous compacted material. The number of roller presses 30 shown is illustrative only, and the ~~present~~ invention is not limited in this regard. Hence, more than two roller presses may be mounted.

The paragraph beginning on page 5, line 4 has been changed as follows:

FIG. 3 is a drawing schematically showing roller presses and compacted material formed by the same according to an embodiment of the ~~present~~ invention.

The paragraph beginning on page 14, line 15 has been changed as follows:

Further, in the embodiment of the ~~present~~ invention, it is preferable to operate the roller press in order to be a specific ratio of an arc length between a corresponding point of the first roller press 31 corresponding to a tip of a protrusion of the second roller press 33 and at least one tip of protrusion of the first roller press 31, to an arc length between the tips of adjacent protrusions of the first roller press 31, is between 0.3 and 0.5. That is, with reference to the enlarged circle of FIG. 3, m is an arc length between the tips of the adjacent protrusions 31a and 31b of the first roller press 31, and n is an arc length from one of the tips of the adjacent protrusions 31a and 31b to a point 31c on the first roller press 31 across from where there is positioned a tip of a protrusion 33c of the second roller press 33 corresponding to

between the tips of the adjacent protrusions 31a and 31b. With the variables m and n set in this manner, it is preferable that a ratio n/m is between 0.3 and 0.5. In FIG. 3, the arc length n is shown as the distance between the tip of the protrusion 31a and the corresponding point 31c. However, the arc length n may just as easily be the distance between the tip of the protrusion 31b and the corresponding point 31c.

The paragraph beginning on page 15, line 8 has been changed as follows:

A cross sectional formation of compacted material manufactured using roller presses as described above will be described with reference to FIG. 4. FIG. 4 is a sectional view of the compacted material 500 manufactured according to an embodiment of the ~~present~~ invention, in which a cross section of the compacted material 500 is taken along a lengthwise direction thereof that is a direction perpendicular to an axial direction of the roller presses.

The paragraphs beginning on page 15, line 24 have been changed as follows:

Further, in the compacted material 500 according to the ~~present~~ invention, if one of the pressed surfaces is referred to as a first surface and the other of the pressed surfaces is referred to as a second surface, grooves of the second surface are positioned between adjacent grooves of the first surface with respect to the cross section that is cut along a lengthwise direction perpendicular to the axial direction of the roller presses. For example, as shown in FIG. 4, a groove 500f of the second surface is positioned between adjacent grooves 500d and 500e of the first surface.

In addition, the compacted material 500 manufactured according to the ~~present~~ invention is formed such that a ratio of an arc length between corresponding point of the first surface corresponding to a groove of the second surface and at least one groove of the adjacent grooves of the first surface, to an arc length between adjacent grooves of the first surface is between 0.3 and 0.5. For example, with reference to FIG. 4, if an arc length

between the grooves 500d and 500e is k, and an arc length between a corresponding point 500g of the first surface across from the groove 500f of the second surface and one of the groove 500d of the first surface is l, then the ratio l/k is 0.3 to 0.5. The same ratio holds for when the groove 500e of the first surface is used. If the ratio l/k is less than 0.3, both groove on the pressed surfaces come to be adjacent such that a thickness of the compacted material is excessively reduced. This may result in the breaking of the compacted material.

In the ~~present~~ invention, a thickness of the compacted material manufactured by operating the roller presses is 3 ~ 30 mm, and a density thereof is 3.5 ~ 4.2 tons/m^3. If the thickness of the compacted material is less than 3 mm, it is possible for the same to break, while if greater than 30 mm the surface of the roller presses may become damaged as a result of the excessive size of the material passed therethrough. The compacted material is therefore manufactured to within this range of thicknesses. Further, since the compacted material is directly used in the melter-gasifier, a density of 3.5 ~ 4.2 tons/m^3 of the compacted material ensures a sufficient level for transfer and a level that is not excessive for the pressure applied thereto by the roller presses during roller pressing such that there is only limited concern of damage to the roller presses. In a subsequent step, the roll pressed compacted material is crushed into predetermined sizes.

The paragraph beginning on page 20, line 16 has been changed as follows:

In the molten iron manufacturing apparatus 10 according to the embodiment of the ~~present~~ invention, if the hot compacted material makes contact with the atmosphere, there is the significant concern that heat may be generated or a fire might occur as a result of undergoing re-oxidation with oxygen. Therefore, to prevent oxidation of the compacted material, a nitrogen injection pipe for supplying nitrogen is installed to thereby perform filling of nitrogen so that oxygen density is reduced. With reference to FIG. 1, nitrogen may be supplied to elements where the compacted material has a high chance of making contact

with the atmosphere, that is, to the open/close valve 15, the roller presses 30, the first crusher 40, the second crusher 80, and the hot conveying unit 90.

FIG. 7 is a drawing schematically showing a dust collector 700 according to an embodiment of the ~~present~~ invention.

The paragraph beginning on page 21, line 12 has been changed as follows:

An experimental example of the ~~present~~ invention is described below. This experimental example is used only to illustrate the present invention, and is not meant to be restrictive.

The paragraph beginning on page 23, line 3 has been changed as follows:

As shown in Table 1, the compacted material manufactured according to the embodiment of the ~~present~~ invention may be produced to a thickness of 16 mm or less such that productivity was increased and the amount of powder generated was reduced. Further, in the embodiment of the present invention, no breaks or splits occurred, and the compacted material had superior properties compared to the compacted material manufactured according to the first through third comparative examples.

In the apparatus and method for manufacturing molten iron using fine coal and fine iron ore of the ~~present~~ invention described above, a method of hot compacting fine direct reduced iron is provided to facilitate the manufacture of molten iron, and to improve efficiency and productivity. The ~~present~~ invention also allows more flexibility with respect to equipment operation during the manufacture of compacted material.

The paragraph beginning on page 24, line 31 has been changed as follows:

Although embodiments of the ~~present~~ invention have been described in detail hereinabove in connection with certain exemplary embodiments, it should be understood that

the invention is not limited to the disclosed exemplary embodiments, but, on the contrary is intended to cover various modifications and/or equivalent arrangements included within the spirit and scope of the ~~present~~ invention, as defined in the appended claims.